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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/668,555	09/22/2003	Ray-Hua Hornig	13942 B	2908
36672	7590	07/29/2005	EXAMINER	
CHARLES E. BAXLEY, ESQ. 90 JOHN STREET THIRD FLOOR NEW YORK, NY 10038			DOTY, HEATHER ANNE	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/668,555

Applicant(s)

HORNG ET AL.

Examiner

Heather A. Doty

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 13-15 and 18-25 is/are pending in the application.
- 4a) Of the above claim(s) 19, 21-23 and 25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 13-15, 18, 20 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Election/Restrictions

In the office action dated 01/10/2005, the former examiner required the Applicant to elect one species of LED epitaxial semiconductor material and one species of mirror material. The species of LED epitaxial semiconductor material was to be chosen from a list labeled A. The species of mirror material was to be chosen from a list labeled B (see page 3). The Applicant's response dated 02/02/2005 is improper because no single LED material is clearly elected and no single mirror material is clearly elected. Applicant appears to have elected AlGaInP (species A2) for the LED material and Ag (species B1) for the mirror material. Therefore, all pending claims not directed to these materials will be withdrawn as nonelected. Upon allowance of claim 13 of the present claim set, the Applicant will be entitled to rejoinder of the nonelected species.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824).

Regarding claim 13, Ishikawa et al. teaches a light emitting diode with a mirror comprising an LED epitaxial structure (Fig. 23; column 20, line 20 – column 21, line 43) sequentially comprising a second cladding layer (307), an active layer (308), a first

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cladding layer (309), a window (310 allows passage of red and green light; column 21, lines 15-16), and a metal contact layer (319), wherein said second cladding layer is partially exposed; a first electrode on said metal contact layer (layer 319 is Au/Zn, the metal contact layer and electrode; column 20, lines 61-62), a second electrode formed on said exposed second cladding layer (317); and a mirror formed beneath said LED epitaxial structure (306).

Ishikawa et al. does not teach a permanent metal substrate plated beneath said mirror.

Chen et al. teaches a method for forming an LED with a copper substrate plated beneath a mirror to provide a substrate with high thermal and electrical conductivity, thereby increasing the reliability and duration time of the LED (column 2, line 55 – column 3, line 4; column 4, line 64 – column 5, line 9).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Ishikawa et al. and Chen et al. to fabricate an LED as taught by Ishikawa et al. and provide the LED with a copper plated substrate, as taught by Chen et al. The motivation for doing so at the time of the invention would have been to improve the device's reliability and duration time, as expressly taught by Chen et al.

Regarding claim 14, Ishikawa et al. and Chen et al. together teach the diode as claimed in claim 13. Ishikawa et al. further teaches that the LED epitaxial structure is made from $(Al_xGa_{1-x})_yIn_{1-y}P$, wherein $0 \leq x \leq 1$, $0 \leq y \leq 1$ (column 20, lines 24-43).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824) as applied to claim 13 above, and further in view of Jou et al. (U.S. 5,869,849).

Regarding claim 15, Ishikawa et al. and Chen et al. together teach the light emitting diode as claimed in claim 13. They do not teach forming a transparent conductive film between a first electrode and a metal contact layer.

Jou et al. teaches a light emitting diode with a transparent conductive film (ITO, **570** in Fig. 6e) formed between an electrode (**560b** in Fig. 6e) and a contact layer (**520** in Fig. 6e) to act as a current-spreading layer (column 4, lines 25-35).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to form an ITO layer, as taught by Jou et al., between the metal contact layer and electrode layer taught by Ishikawa et al. and Chen et al. together. The motivation for doing so at the time of the invention would have been to provide a current-spreading layer, as expressly taught by Jou et al.

Claims 18, 20, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824) as applied to claim 13 above, and further in view of Yang (U.S. 2003/0155579).

Regarding claims 18, 20, and 24, Ishikawa et al. and Chen et al. together teach the light emitting diode as claimed in claim 13, but they do not teach that the mirror is made from a composite of a metal with a low refractivity and an insulating layer with a high refractivity, and said insulating layer is adjacent to said LED epitaxial structure or

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that the mirror is made from a material selected from the group consisting of Ag, Au, Au/Zn, Au/Be, Au/Ge, Au/Ge/Ni and Zn, or mixtures thereof.

Yang teaches an LED structure made from $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$, wherein $0 \leq x \leq 1$, $0 \leq y \leq 1$ (paragraph 0016), including a mirror made of a metal with a low refractivity (Al, Ag, or Au, layer **12** in Fig. 2; paragraph 0018) and an insulating layer with a high refractivity (SiO_2 , Al_2O_3 , layers **11** and **14** in Fig. 2; paragraphs 0017-0018), and said insulating layer is adjacent to the LED epitaxial layer. This combination of mirror materials provides a highly reflective surface (paragraph 0007) with a protection surface (paragraph 0017).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to fabricate the LED taught by Ishikawa et al. and Chen et al. together, and further fabricate the mirror structure from a composite of a metal with a low refractivity such as Al or Ag and an insulating layer with a high refractivity, with the insulating layer adjacent the LED epitaxial structure, as taught by Yang. The motivation for doing so at the time of the invention would have been to provide a mirror with a highly reflective surface and a layer to protect it, as expressly taught by Yang.

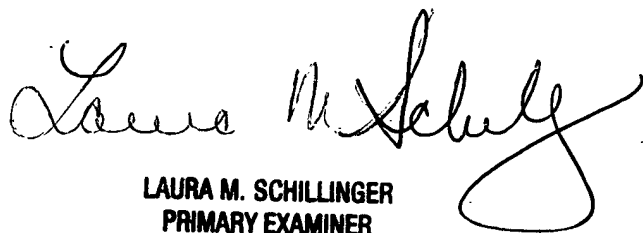
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had



LAURA M. SCHILLINGER
PRIMARY EXAMINER